Amendments to Drawings:

Please substitute the attached replacement sheet for Figures 2 and 4 to provide the correct label for block 12. Annotated and replacement sheets are attached. No new matter has been added.

REMARKS

Claims 1-10 are pending in the present application. The Office Action and cited references have been considered. Favorable reconsideration is respectfully requested.

The Office Action notes that the ADS claims a priority date of November 4, 2000. This is a typographical error. The correct priority date of October 4, 2002, is reflected in the declaration and the application transmittal letter. A substitute corrected ADS is being filed concurrently herewith to correct this error. Confirmation of Applicant's claim for priority is respectfully requested.

Applicants have amended Figs. 2 and 4 to translate the block label "CANALE" in block 12, to the English equivalent of "CHANNEL". Approval is respectfully requested.

Claims 1 was rejected under 35 U.S.C. §103(a) as being unpatentable over Dunn et al. (U.S. Patent No. 6,154,772) in view of Young (U.S. Patent No. 6,011,950). Claims 2-10 were rejected under 35 U.S.C. §103(a) as being unpatentable over Dunn in view of Young, further in view of Ono et al. (hereinafter referred to as Ono) (U.S. Patent No. 6,879,768). These rejections are respectfully traversed for the following reasons.

Claim 1 recites a system for the transmission of DVB/MPEG digital signals, particularly for satellite communication, comprising a transmitting station in which a multiplexer (32) inserts null packets in the DVB/MPEG streams originating from one or more 5 VBR coders or generic data sources (31) so that their bit-rates are made uniform, and multiplexes them into a single transport stream that is then applied to a modulating

chain for transmission over a propagation channel, and a receiving station in which a demodulating chain receives the signal being transmitted over the channel, reconstitutes the transport stream and applies it to a demultiplexer. The modulating chain in the transmitting station comprises a control circuit (72) controlling the bit-rate of the MPEG coders or generic data sources (31), a null-packet eliminator (60) for removing null packets from the transport stream received from the multiplexer (32), and an ACM modulator (62) downstream of the eliminator, which is programmed for coding the stream with the maximum ruggedness allowed by the rate of the incoming useful packets. The receiving station comprises an ACM demodulator (64), a null-packet re-inserter (66) for re-inserting null packets in the transport stream, and an evaluator of quality of service (68) driven by the ACM demodulator ACM (64) for notifying the level of quality of the received signal to the bit-rate control circuit (72) of the transmitting station via a return channel. The bit-rate control circuit (72) is programmed to change the bit-rate of the VBR coder or coders or generic data sources (31) depending on the level of quality of service notified by the evaluator (68). This is not taught, disclosed or made obvious by the prior art of record.

Applicants first provide a brief overview of the invention and how it relates to the prior art generally. This is an elaboration of what is stated more concisely in the introduction to the disclosure. The method of transmission with variable bit-rate (VBR) adaptive coding and modulation (ACM) has been developed and applied for some time to truly VBR streams, while the constant-bit-rate (CBR) nature of the MPEG Transport-Stream protocol has been obviously seen as a barrier for its transportation over an ACM link.

In fact, the rigidity of the DVB/MPEG protocol has made it impossible in the past to use the adaptive technique mentioned above. More particularly, this protocol specifies that both the chronological order and the rate of the packets be conserved at reception, and that the overall bit-rate of the transport stream be held constant, because these values are used by the receiver for restoring the program synchronization clock: this circumstance, as will be obvious for a person skilled in the art, has been regarded as irreconcilable with the change of bit-rate required for adapting the system to different conditions of transmission.

Under the MPEG protocol, single or multiple variable bit-rate sources are allowed to be multiplexed into a constant bit-rate Transport Stream – in a so called Statistical Multiplex – and when VBR source packets are not available, the Transport Stream is filled up with null-packets.

The total bit-rate of a Transport-Stream must be rigorously constant, as well as the channel end-to-end delay (if the transmitter bit-rate is constant, but the network introduces delay variations, the resulting bit rate before the MPEG decoder becomes variable).

Methods for changing the bit-rate of a Transport Stream at the boundary between two constant bit-rate networks have been used in MPEG remultiplexers. However, the remultiplexer will generate a fresh Transport Stream, and will use packet add/drop and complex techniques for updating the PCRs. Some of these techniques are reported in Dunn, but they are not adopted in the present invention, since they are not applicable to continuous bit-rate variations such as that required in ACM transmission.

The present invention of Morello et al. is based on the recognition that under the MPEG protocol, it is not actually necessary to maintain the constant bit-rate nature of a transport-stream in the ACM channel, but it is sufficient that this constant bit-rate and constant end-to-end delay are guaranteed before the ACM modulator and after the ACM receiver. Based on this recognition, the invention combines a number of individually known, simple techniques to solve the problem of using ACM with MPEG streams, a problem which had been previously regarded as inherently contradictory. To achieve this aim, the invention combines the following techniques:

1) controlling the bit-rate of the video coding source or of the interactive data sources, rather than using a trans-rate multiplexer, as would be done conventionally,

2) generating a conventional constant bit-rate Transport Stream with a varying percentage of null-packets (the lower the source bit-rate, the higher the percentage of null-packets),

3) deleting the null-packets in the ACM transmitter, so that the rate on the channel may change as required by ACM, and

4) re-inserting null-packets at the ACM receiver, exactly in the position where they had been removed.

It can be seen that the signal in the path between the ACM transmitter and the ACM receiver is not a DVB Transport Stream, although the re-insertion of the null packets will generate a DVB Transport Stream after the demodulator that is an exact copy of the original one.

This combination is neither disclosed nor hinted in any of the prior art references and is embodied in a system for the transmission of DVB/MPEG as defined in claim 1.

The Examiner relies on Dunn mainly because it shows that inserting and eliminating null packets in a DVB/MPEG stream, in a system for satellite communication, was well known at the time. This situation has been also acknowledged in Morello's disclosure, e.g., on page 4, lines 23 et. seq., referring to Fig. 2 of the application (emphasis added):

> *The system of Figure 1 is shown in more detail in Figure 2. The transmitting station 10 comprises a plurality of sources 30 of audio/video signals, driving respective MPEG coders 31 at a variable bit-rate (VBR). The streams of DVB/MPEG packets generated by coders 31 are applied to respective inputs of a multiplexer 32, which inserts null packets within the individual streams, in a way known per se, to the extent necessary to produce a constant bit-rate, before multiplexing the individual streams into a single transport stream TS, which is then applied to a modulating chain ...*

In the MPEG system, digital data, such as a television take, are transmitted as a sequence of data packets. A packet containing a full digital description of an instantaneous image may be followed by several packets describing only the changes of subsequent instantaneous images from the previous images, until a packet with a full description is again issued. Where the scene taken is dynamically changing, such as in a sports event, the information content to be transmitted is large, while in the case of a more static scene, such as the take of an interview of a sitting person, the information content is much lower.

Young is directed to transcode digital TV signals received from a satellite to a signal appropriate for cable transmission. More particularly, Young discloses an improved transcoder which can take a satellite signal for transmission via satellite in a form for either 256-QAM or 64-QAM channels, and convert it into a cable signal compatible with cable equipment of either capacity.

However, the system of Young does not have an ACM modulator/demodulator. Although an acronym ACM appears on Fig. 3 of Young (reference number 73), the component in question is not an ACM in the sense used in the Applicant's description, and claims but rather an "access control module", as can be seen in col. 7, lines 14 et seq. of the Young disclosure:

> *In such a case, an access control module 73 may be provided to interpret, generate, or modify such command such that cable operators can control access not only to complete program services but also to individual programs, as in pay-per-view.*

The component 73 is not again mentioned in the document, but its function is adequately described in the above quotation, and has nothing to do with the ACM of the the Applicants' disclosure, where this abbreviation stands for Adaptive Coding and Modulation (see page 2, line 25).

Also, Young never mentions a quality of service evaluator, and certainly not one that feeds a QoS signal back to the satellite transmitter. It is true that the bit-error rate BER is mentioned in col. 5, lines 42 to 50, as follows:

> *The transmitter has a switch 34 which can set the convolution coding rate of the satellite-FEC encoder, thus providing multiple data rates. The purpose of varying the coding rate is to match the transmitter and receiver with the satellite link performance*

> *so that the receiver can get all the information bits correctly. The satellite link performance is described in terms of a bit-error rate (BER) which depends on a number of factors such as ionospheric effect and atmospheric effects due to clouds, rain, fog, etc.*

However, as shown by the subsequent disclosure, that is a mere generic statement of the conventional designing criteria of the transmitter, and explains why the transmitter has a switch 34 at all, and does not imply or suggest any attempt to dynamically adapt the FEC encoder to the instantaneous performance of the link. What this statement intends to say is: By means of switch 34, the FEC encoder is configured, in principle once for all, so that the bit error rate for the link is acceptable, and the configuration then remains stationary unless the manager of the satellite transmitter subsequently decides to revise it.

The subsequent disclosure of Young clearly contemplates only a choice between two bit-rates, corresponding to two cable equipments available. See, for example, col. 6 lines 8 to 15:

> *Thus, by switching the satellite-FEC encoder 33 between the 1/2 rate and the 3/4 rate, the usable information bit rate through the same modulated satellite carrier can be changed between 25.8 Mbps and 38.8 Mbps, suitable respectively for full 64-QAM and full 256-QAM cable transmission using a 6-Mhz cable slot. The switch 34 can be operated by either hardware or software as will be apparent to those skilled in the art.*

Clearly, the above lines imply a permanent choice to be made by the cable operator, depending on the cable equipment installed. This is confirmed in the following paragraph, which reads:

> *Therefore, if the cable operator has not upgraded its equipment to 256 QAM, the cable program suppliers can use the satellite*

> *transmitter to transmit cable programs in a form that can be received by the 64-QAM equipment.*

Also, Young comprises no quality of service evaluator in the receiver, and certainly not one that dynamically controls the behavior of the satellite transmitter through a return channel.

Nothing even remotely similar is disclosed or hinted anywhere in the disclosure.

It can therefore be seen that Young refers to a configurable constant bit-rate transmission by satellite (therefore fulfilling the Transport Stream rules) with the only particularity of being suitable, with a single satellite modulator/FEC encoder, to feed two different types of constant bit-rate cable networks (each of them complying with the Transport Stream Rules), a 64QAM cable network capable of 27 Mbps or a 256QAM cable network capable of 38.8 Mbps. In Young, no automatic or manual switching of FEC protection is carried out in the transmitter in order to cope with the satellite propagation channel as used in Adaptive Coding and Modulation.

In conclusion, even if a person skilled in the art should try to combine the teachings of Young with those of Dunn, this could not lead to the invention as claimed in claim 1. In particular, any combination of Dunn with Young would lack at least an ACM modulator, an ACM demodulator, and an evaluator of quality of service controlling the transmitting station via a return channel. For at least these reasons, Applicants respectfully submit that claim 1 is patentable over the prior art, whether taken alone or in combination as proposed in the Office Action.

Applicants respectfully submits that claims 2-10 are patentable for the reasons discussed above with respect to claim 1. Further, Ono is concerned with an information processing apparatus/method where desired packets are selected from a multiplexed transport stream for purposes of recording the data. Admittedly, Ono discloses a mechanism for null-packet deletion before recording an MPEG Transport Stream, and for re-introduction during play-back before MPEG decoding. The mechanism is intended to save storage capacity while recording a constant bit-rate program, and is somewhat akin to the deletion/insertion mechanism employed by Morello et al., although it operates in an environment that that is not changeable, but rather is under full control of the operator.

Even when combined with Dunn and Young, Ono would not lead to the combination of any of claims 2 to 10, for the following reasons:

(1) the combination would not have ACM modulation and demodulation, as shown above;

(2) Ono does not drive the MPEG encoder's bit-rate by means of a return channel, after reception quality of service analysis (BER, C/N, ...); and

(3) the recording channel targeted by Ono has a well-controlled reading speed, sufficient to generate a constant Transport Stream bit-rate as required by MPEG. By contrast, the ACM channel, when crossed by a variable bit-rate stream, introduces variable delays as explained above.

In particular, with reference to claims 7 and 8, the null-packet eliminator there recited does have a similar functionality to that described by Ono. However, Ono just

appends the counter contents to the packet, without modifying the header of a selected packet to incorporate the count reached by the counter. By contrast, the Applicant s ' invention replaces part of the sync byte to transport the counter contents.

Again, the three references Dunn, Young and Ono cannot be combined to yield the matter claimed in claims 7 and 8, for the same reasons already stated above, i.e. lack of a number of features recited in claim 1. Similar arguments as above hold for claims 9 and 10.

For at least these reasons, Applicant respectfully submits that claims 2-10 are patentable over the prior art of record whether taken alone or in combination as proposed in the Office Action.

In view of the above amendment and remarks, Applicants respectfully request reconsideration withdrawal of the outstanding rejections of record. Applicants submit that the application is in condition for allowance and early notice to the effect is most earnestly solicited.

If the Examiner has any questions, he is invited to contact the undersigned at 202-628-5197. Additionally, if the Examiner is inclined to maintain the rejection, he is requested to contact the undersigned to schedule an interview to advance prosecution.

Respectfully submitted,

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